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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/506,762	03/11/2005	Tsuyoshi Harada	Y03S016PCT-US	6673

35910 7590 09/26/2006

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EXAMINER	
YANG, ANDREW GUS	
ART UNIT	**PAPER NUMBER**
2628	

DATE MAILED: 09/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/506,762	HARADA ET AL.	
	Examiner	Art Unit	
	Andrew Yang	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 7-14* is/are rejected.

7)☒ Claim(s) *6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

MY 9-22-06

Claims 1-5, 7-14 ~~1-14~~ are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato (U.S. Patent No. 6,462,738) in view of Migdal et al. (U.S. Patent No. 6,356,263).

With respect to claim 1, Kato discloses a method for generating a control mesh for three-dimensional objects to be used in CAD applications (column 3, lines 29-31). Kato discloses a resolution level generator 108 in Fig. 1 to calculate resolution levels for each polygon (column 4, lines 15-17). Resolution levels determine whether and how much a polygon is subdivided. Subdividing a polygon provides higher resolutions, as a subdivided polygon appears more smoothly curved and appears to have more detail upon rendering than a polygon that is not subdivided. A vertex-specific resolution level allows subdivision to occur precisely where it is needed (column 4, lines 17-23). Therefore, said resolution level is a rough conversion tolerance for a polygon in the mesh and the vertex-specific resolution level is a specified conversion tolerance for the vertex in the mesh. Triangular Bezier patches (bicubic patches) are used to represent the curved surface represented by a polygon and 10 control points are required to create a bicubic Bezier patch. As shown in Fig. 9, a polygon 900 is comprised of 3 edge splines 901, 902, 903 (column 7, lines 23-33). Therefore, the reconstruction of the

surface approximates a boundary edge (3 edge splines 901, 902, 903) and each of the curves with a polyline comprising points (control points) and connecting lines within to define boundary points which are the points of the polylines according to the vertex-specific resolution level (conversion tolerance) obtained by the polygon subdivision. The surface normal data is used to generate two tangents at each vertex to convert the 3 edge splines 901, 902, 903 into 1 Bezier triangular patch (column 7, lines 35-40), thus obtaining a vector tangential to the curve at each of the boundary points shown in Fig. 9. The distance the Bezier patch will project from the plane containing the endpoints of the patch is computed responsive to equation 914 in Fig. 9, and assigned to the last Bezier parameter field, giving the last of the 10 Bezier control points. It is noted that Kato does not explicitly teach generating polygons with three or four vertices by connecting internal points. OFFICIAL NOTICE is taken that is well known to generate polygons by connecting internal points to form Bezier patches. Therefore, it would have been obvious to generate polygons by connecting internal point (b111 in Fig. 9) to the boundary points as shown in Fig. 9 because this would generate the curved surface by using a Bezier patch. Surface normal data for the polygons are generated 300 in Fig. 3 (column 3, lines 60-61) and both normal vector and tangent vector are stored (column 3, line 61, column 4, lines 5-6). The surface normal data and tangents at each vertex is used to convert 3 edge splines 901, 902, 903 into 1 Bezier triangular patch (column 7, lines 35-40), thus using a plurality of control points obtained by processing the information identifying the vertices, the normal vectors, and the tangent vectors. However, Kato does not expressly disclose the last step of examining of each of the

triangular or quadrilateral surfaces is close to the face represented by the CAD data within the specified conversion tolerance and if not regenerating a mesh with a narrower mesh width and more mesh lines.

Migdal et al., who also deal with modeling a three-dimensional model with a mesh, disclose a method for adaptive subdivision of triangulated surfaces. The subdivision criteria seeks to maintain surface continuity of the mesh model after subdivision is performed (column 5, lines 26-33). Both the level of detail refinement, based on the subdivision criteria value, and the area of the mesh model to be enhanced with additional detail are selectable by the user (column 5, lines 63-66). The level of detail refinement specified by Migdal et al. is analogous to a specified conversion tolerance because both are used to indicate the accuracy in modeling a three-dimensional object. Migdal et al. also disclose regenerating a mesh with a narrower mesh width and more mesh lines by checking in sequence three edges of a selected triangle to determine for each edge whether or not that edge should be subdivided (column 9, lines 28-30), thereby narrowing the mesh width.

Kato and Migdal et al. are analogous in that they are both in the same field of endeavor, namely three-dimensional object modeling.

At the time of the invention, it would have been obvious to one skilled in the art to combine the method of refining a mesh as taught by Migdal et al. in the Kato reference because this would maintain surface continuity of the mesh model after subdivision is performed (column 5, lines 32-33) and a user can have varying level of detail refinement

selected for different areas of the same mesh model depending on the requirements of the specific user (column 6, lines 7-9 of Migdal et al.).

With respect to claim 2, Kato discloses the method of claim 1 wherein a curved face reconstruction engine 118 in Fig. 1 receives the polygon information and reconstruction data as well as the vertex information of the new vertices added during subdivisions to reconstruct 216 the curved surface with the additional polygons created by the subdivision (column 7, lines 6-11). Kato also discloses retrieving position information of the vertices (column 7, lines 18-19). It is noted that Kato does not explicitly disclose joining two adjacent polygons. OFFICIAL NOTICE is taken that it is well known to join adjacent polygons, given polygon information and vertex positions, as disclosed by Kato. Therefore, it would have been obvious for Kato to join adjacent polygons because this would form a complete mesh model comprised of adjacent polygons.

With respect to claims 3-5, Kato discloses the method of claim 1, wherein the polygons are triangles and the surface is a Bezier surface (column 7, lines 23-24) as in Fig. 9. It is noted that Kato does not explicitly teach the curve being a Bezier curve. OFFICIAL NOTICE is taken that Bezier curves are well known for modeling objects. Therefore, it would have been obvious for Kato to use Bezier curves to represent a three-dimensional object because this would allow for modeling curves using control points, as already disclosed by Kato.

With respect to claim 7, Kato discloses the method of claim 1, further comprising generating a control mesh from the surface representation using known tessellation

techniques to extract polygon data from the surface representation (column 3, lines 44-47). A surface representation generator 100 in Fig. 1 generates an object to be displayed on a computer display (column 3, lines 27-28).

With respect to claim 8, Kato discloses a method for approximating CAD data as in claim 1, step (e) and claim 7; see rationale for rejection of claim 1 step (e) and claim 7, respectively.

With respect to claims 9-11, Kato discloses the method of claim 8 as in claims 3-5; see rationale for rejection of claims 3-5, respectively.

With respect to claim 12, Kato discloses the method of claim 8. A resolution level generator 108 in Fig. 1 calculates resolution levels for each polygon (column 4, lines 15-17). Resolution levels determine whether and how much a polygon is subdivided. Subdividing a polygon provides higher resolutions, as a subdivided polygon appears more smoothly curved and appears to have more detail upon rendering than a polygon that is not subdivided. A vertex-specific resolution level allows subdivision to occur precisely where it is needed (column 4, lines 17-23). Therefore, Kato discloses acquiring display conditions including display shapes and sizes (the resolution and level of detail of the displayed object). It is deemed inherent that Kato determines whether or not a detailed display be performed depending on the display conditions because Kato does not display the object unless said conditions are met. Otherwise, Kato displays the object (see rationale for rejection of claim 7) processed by steps (j) – (l).

With respect to claim 13, Kato discloses a method for executing sequenced instructions (column 3, lines 18-22) for executing the method of claim 1; see rationale

for rejection of claim 1. It is deemed inherent that a computer memory medium is included for storing said instructions for a computer to execute said instructions.

With respect to claim 14, Kato discloses a method for executing sequenced instructions (column 3, lines 18-22) for executing the method of claim 8; see rationale for rejection of claim 8. It is deemed inherent that a computer memory medium is included for storing said instructions for a computer to execute said instructions.

Allowable Subject Matter

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patent is cited to further show the state of the art modeling mesh objects:

U.S. Patent No. 6,130,673 to Pulli et al. for a method of editing a mesh surface

U.S. Patent No. 6,650,324 to Junkins for a method of defining surface normals for a mesh surface.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Yang whose telephone number is (571) 272-5514. The examiner can normally be reached on 8:30-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on (571) 272-7653. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AGY

9/21/06

MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
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